

We claim:

- 1 1. A method for determining crystallization conditions for a material, the
2 method comprising:
3 taking a plurality of different crystallization samples in an enclosed
4 microvolume, the plurality of crystallization samples comprising a material to be
5 crystallized and crystallization conditions which vary among the plurality of
6 crystallization samples;
7 allowing crystals of the material to form in plurality of crystallization
8 samples; and
9 identifying which of the plurality of crystallization samples form crystals.
- 1 2. The method according to claim 1 wherein the material to be crystallized is
2 a macromolecule.
- 1 3. The method according to claim 1 wherein the material to be crystallized is a
2 protein.
- 1 4. The method according to claim 1 wherein the material to be crystallized is a
2 macromolecule with a molecular weight of at least 500 daltons.
- 1 5. A method according to claim 1 wherein the material to be crystallized is
2 selected from the group consisting of viruses, proteins, peptides, nucleosides,
3 nucleotides, ribonucleic acids, deoxyribonucleic acids.
- 1 6. A method according to claim 1 wherein the material to be crystallized is
2 selected from the group consisting of viruses, proteins, peptides, nucleosides,
3 nucleotides, ribonucleic acids, deoxyribonucleic acids.
- 1 7. A method according to claim 1 wherein the enclosed microvolume is a
2 lumen.

- 1 8. A method according to claim 1 wherein the enclosed microvolume is a
2 lumen with a cross sectional diameter of less than 2.5 mm.
- 1 9. A method according to claim 1 wherein the enclosed microvolume is a
2 lumen with a cross sectional diameter of less than 1 mm.
- 1 10. A method according to claim 1 wherein the enclosed microvolume is a
2 lumen with a cross sectional diameter of less than 500 microns.
- 1 11. A method according to claim 1 wherein the enclosed microvolume is a
2 microchamber.
- 1 12. A method according to claim 1 wherein the enclosed microvolume is at
2 least partially enclosed within a substrate which comprises other enclosed
3 microvolumes which also comprise crystallization samples.
- 1 13. A method according to claim 1 wherein the enclosed microvolume is at
2 least partially enclosed within a card shaped substrate.
- 1 14. A method according to claim 1, the method further comprising performing
2 a spectroscopic analysis on a crystal formed within a microvolume within the
3 microvolume.
- 1 15. A method according to claim 14, wherein the spectroscopic analysis is
2 selected from the group consisting of Raman, UV/VIS, IR or x-ray spectroscopy.
- 1 16. A method according to claim 14, wherein the spectroscopic analysis is x-
2 ray spectroscopy.
- 1 17. A method according to claim 1, wherein the microvolume is enclosed
2 within a material defining the microvolume such that in a volume of the
3 microvolume and the material defining the microvolume that an x-ray beam used
4 for x-ray spectroscopy of a crystal will traverse in the process of performing x-ray
5 spectroscopy on a crystal within the microvolume, the volume of the microvolume

6 contains at least as many electrons as the sum of the electrons contained in the
7 volume of the material defining the microvolume that the x-ray beam will traverse.

1 18. A method according to claim 1, wherein the microvolume is enclosed
2 within a material defining the microvolume such that in a volume of the
3 microvolume and the material defining the microvolume that an x-ray beam used
4 for x-ray spectroscopy of a crystal will traverse in the process of performing x-ray
5 spectroscopy on a crystal within the microvolume, the volume of the microvolume
6 contains at least three times as many electrons as the sum of the electrons
7 contained in the volume of the material defining the microvolume that the x-ray
8 beam will traverse.

1 19. A method according to claim 1, wherein the microvolume is enclosed
2 within a material defining the microvolume such that in a volume of the
3 microvolume and the material defining the microvolume that an x-ray beam used
4 for x-ray spectroscopy of a crystal will traverse in the process of performing x-ray
5 spectroscopy on a crystal within the microvolume, the volume of the microvolume
6 contains at least five times as many electrons as the sum of the electrons contained
7 in the volume of the material defining the microvolume that the x-ray beam will
8 traverse.

1 20. A method according to claim 1, wherein the microvolume is enclosed
2 within a material defining the microvolume such that in a volume of the
3 microvolume and the material defining the microvolume that an x-ray beam used
4 for x-ray spectroscopy of a crystal will traverse in the process of performing x-ray
5 spectroscopy on a crystal within the microvolume, the volume of the microvolume
6 contains at least ten times as many electrons as the sum of the electrons contained
7 in the volume of the material defining the microvolume that the x-ray beam will
8 traverse.

1 21. A method according to claim 1, wherein material defining the microvolume
2 comprises a groove designed to reduce a number of electrons that an x-ray beam
3 used for x-ray spectroscopy of a crystal will traverse in the process of performing
4 x-ray spectroscopy on a crystal within the microvolume.

- 1 22. A method according to claim 1, wherein the method further comprises
2 delivering the plurality of different crystallization samples to the enclosed
3 microvolume.
- 1 23. A method according to claim 1, wherein the method further comprises
2 forming the plurality of different crystallization samples within the enclosed
3 microvolume.
- 1 24. A method according to claim 1, wherein one or more dividers is positioned
2 between the crystallization samples to separate the crystallization samples within
3 the enclosed microvolume.
- 1 25. A method according to claim 1, wherein the divider is formed of an
2 impermeable material.
- 1 26. A method according to claim 25, wherein the impermeable material is an
2 impermeable liquid.
- 1 27. A method according to claim 25, wherein the impermeable material is an
2 impermeable solid.
- 1 28. A method according to claim 25, wherein the divider is formed of a
2 permeable material.
- 1 29. A method according to claim 25, wherein the divider is formed of a
2 semipermeable material.
- 1 30. A method according to claim 29, wherein the semipermeable material is a
2 gas.
- 1 31. A method according to claim 29, wherein the semipermeable material is a
2 liquid.

1 32. A method according to claim 29, wherein the semipermeable material is a
2 gel.

1 33. A method according to claim 25, wherein the divider forms an interface
2 selected from the group consisting of liquid/liquid, liquid/ gas interface, liquid/
3 solid and liquid/ sol-gel interface.

1 34. A method according to claim 25, wherein the divider is selected from the
2 group consisting of a membrane, gel, frit, and matrix

1 35. A method according to claim 25, wherein the divider functions to modulate
2 diffusion characteristics between adjacent crystallization samples.

1 36. A method according to claim 25, wherein the divider is formed of a
2 semipermeable material which allows diffusion between adjacent crystallization
3 samples.

1 37. A method for determining crystallization conditions for a material, the
2 method comprising:
3 taking a plurality of different crystallization samples in a plurality of
4 enclosed microvolumes, each microvolume comprising one or more crystallization
5 samples, the crystallization samples comprising a material to be crystallized and
6 crystallization conditions which vary among the plurality of crystallization
7 samples;
8 allowing crystals of the material to form in plurality of crystallization
9 samples; and
10 identifying which of the plurality of crystallization samples form crystals.